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For:	Human-Computer Interface Including Haptically Controlled Interactions		

Mail Stop Appeal Brief – Patents
Commissioner for Patents
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Appeal Brief

Applicant submits herewith three copies of an Appeal Brief under 35 U.S.C. 134 and 37 CFR 1.191 and 1.192, following a Final Rejection mailed by the Office 6/30/2004, a Notice of Appeal mailed by Applicant 10/30/2004, and an Advisory Action mailed by the Office 12/7/2004.

Applicant encloses herewith a check for **$500** in payment of the Appeal Brief fee.

Respectfully submitted,

V. Gerald Grafe

Dec. 28, 2004
date

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I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited on the date shown below with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Dec. 28, 2004
date

V. Gerald Grafe
name

Appeal Brief

Real Party in Interest

The subject application has been assigned to Novint Technologies, Inc.

Related Appeals and Interferences

There are no related appeals or interferences known to Appellant, Appellant's legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the present appeal.

Status of Claims

The Office rejected Claims 1-23 under 35 U.S.C. § 103(a) as unpatentable over *Rosenberg* (U.S. 6,259,382) in light of *Snibbe* (U.S. 6,496,200). The rejection was made in an Office Action mailed 12/24/2003, and maintained in a Final Office Action mailed 6/30/2004, and in an Advisory Action mailed 12/7/2004.

Status of Amendments

There were no amendments filed after the Final Office Action.

Summary of Invention

The present invention provides a method of human-computer interfacing that provides force feedback (also known as haptic feedback) to control interface interactions such as scrolling or zooming of a document within an application. Haptic feedback in the present invention allows the user more intuitive control of interactions such as scrolling or zooming, and allows the user's visual focus to remain on the application. The method comprises providing a control domain within which the user can control such interactions. For example, a haptic boundary can be provided corresponding to scrollable portions of the application domain. The user can position a cursor near such a boundary, feeling its presence haptically (reducing the requirement for visual attention for control of scrolling of the display). The user can then apply force relative to the boundary, causing the interface to scroll the domain. The rate of scrolling can be related to the magnitude of applied force, providing the user with additional intuitive, non-visual control of scrolling. The invention also can provide for intuitive scrolling control by exploiting specific methods of interaction with a three dimensional input device.

Issues

1. Is the proposed combination of *Rosenberg's* teaching (isotonic/isometric haptic controls) with *Snibbe's* teaching (changing force feedback resolution) proper to produce the claimed invention (force-based control of the visual display of a document)?

2. Does the art teach or suggest force-based control of a visual display of a document based on determination of the distance of a cursor from a haptic boundary?
3. Does the art teach or suggest force-based scrolling of a visual display of a document, with haptic boundaries at the top and bottom of the display, and with scrolling disabled when the visual display is in certain states?
4. Does the art teach or suggest force-based scrolling of a visual display of a document, with haptic boundaries corresponding to the boundaries of a document displayed?
5. Does the art teach or suggest force-based scrolling of the visual display of a document, with the force-based scrolling responsive to cursor motion relative to haptic boundaries established by a control portion of a haptic space?
6. Does the art teach or suggest force-based scrolling of the visual display of document, with the force-based scrolling activated by moving a cursor into a defined control zone of the haptic space?
7. Does the art teach or suggest force-based scrolling of the visual display of a document dependent on cursor motion relative to a three-dimensional control zone?
8. Does the art teach or suggest force-based scrolling of the visual display of a document dependent on cursor motion relative to a three-dimensional control zone, with the force-based scrolling initiated by cursor motion through an entry region into an active region?
9. Does the art teach or suggest force-based scrolling of the visual display of a document dependent on cursor motion relative to a three-dimensional control zone, with the three-dimensional control zone active in a subset of the motion of an input device in a z dimension?
10. Does the art teach or suggest scrolling of the visual display of a document, whose rate is dependent on a force applied by a user to an input device?

Grouping of Claims

Because of the various combinations of limitations recited in the various claims:

Claims 1-3 and 17 are patentable independent of the other claims.

Claim 4 is patentable independent of the other claims.

Claim 5 is patentable independent of the other claims.

Claims 6 and 18 are patentable independent of the other claims.

Claim 7 is patentable independent of the other claims.

Claims 8-9 are patentable independent of the other claims.

Claims 10 and 19 are patentable independent of the other claims.

Claims 11-14 are patentable independent of the other claims.

Claims 15-16 are patentable independent of the other claims.

Claim 20 is patentable independent of the other claims.

Claim 21 is patentable independent of the other claims.

Claim 22 is patentable independent of the other claims.

Claim 23 is patentable independent of the other claims.

Argument

Issue 1. Is the proposed combination of *Rosenberg's* teaching (isotonic/isometric haptic controls) with *Snibbe's* teaching (changing force feedback resolution) proper to produce the claimed invention (force-based control of the visual display of a document)?

The examiner proposed the combination of *Rosenberg* with *Snibbe* to support the rejection of all claims. Appellant submits that the proposed combination is improper, since there is no suggestion to make the combination, and since the proposed combination is against the express teaching of *Snibbe*. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. MPEP 2143.01. The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. MPEP 2142. Appellant summarizes below the teachings of *Rosenberg* and *Snibbe*, then analyzes the propriety of the proposed combination.

<u>U.S. Patent 6,259,382 (*Rosenberg*).</u> *Rosenberg* teaches a force feedback interface having isotonic and isometric modes of operation. *See, e.g., Rosenberg* Abstract. Much of *Rosenberg's* teaching concerns specific two-dimensional **device embodiments**. *See, e.g.*, Figures 1-7, columns 5-25. The remainder of *Rosenberg* generally concerns specific **two-dimensional user interfaces**, including detail about specific force profiles, software implementations corresponding to the two-dimensional devices, and integration with existing planar window-based interfaces. *See, e.g., Rosenberg* Figures 8-16, columns 26-50. *Rosenberg* mentions haptic scrolling, but teaches no details about how such scrolling can be provided.

<u>U.S. Patent 6,496,200 (*Snibbe*).</u> *Snibbe* teaches a haptic interface device, providing a "haptic display" of an environment. *Snibbe's* haptic interactions comprise simulated detents in rotation of a knob, a squeezable bulb or handle, and a force-sensing arm. *See, e.g., Snibbe* column 10. *Snibbe* teaches changing the **resolution** of a haptic display based on interactions with the user. *See, e.g.,* Snibbe Abstract. In *Snibbe's* teaching, "changing the resolution" means changing the **level of detail** of user interaction. *See, e.g., Snibbe* Abstract; *Snibbe* column 5 lines 32-40. *Snibbe* teaches a system that allows a user to interact

with differing haptic resolutions, where resolution is defined by *Snibbe* to be the magnitude of change in haptic sensation per unit change in the environment. *Snibbe* column 5 lines 6-9. *Snibbe* has no teaching of changing the **portion of a document displayed**, or of **scrolling the display of a document** – *Snibbe* is exclusively concerned with changing the **resolution**, or level of detail, of the interaction. According to *Snibbe*, navigation, or moving around in a haptic space, and resolution control, or changing resolution of a haptic space, can not both be accommodated haptically – if haptic navigation is desired, then resolution control must be non-haptic. *See, e.g., Snibbe* column 14 lines 6-13. *Snibbe* teaches communication of feedback force in two dimensions to a user, but has no mention of force **input** from a user or force-based interactions in **three dimensions**.

<u>The proposed combination.</u> The examiner's combination relies on the combination of *Snibbe's* haptic resolution control teaching with *Rosenberg's* force-based scrolling. However, there is no suggestion or motivation in *Snibbe* or *Rosenberg* to do so. *Snibbe* teaches the use of haptic feedback to control the **resolution** of a haptic display, where resolution means the magnitude of change of haptic sensation. *See, e.g., Snibbe Abstract*; *Snibbe* column 5 lines 6-9. *Snibbe* teaches no way to combine resolution control with haptic navigation. Instead, *Snibbe* teaches that, if haptics are used for navigation, then the resolution control can be accomplished by a separate, non-haptic input. *See Snibbe*, column 14 lines 6-13. Accordingly, combining *Snibbe* with *Rosenberg* requires that the haptic resolution control of *Snibbe* be changed to a non-haptic control, and that *Snibbe's* change in magnitude of haptic sensation be changed to scrolling or zooming. A combination that changes the principal of operation of a reference is not proper. MPEP 2143.01 ("If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti,* 270 F.2d 810, 123 USPQ 349 (CCPA 1959)").

The examiner, in the Advisory Action mailed 12/7/2004, asserted that the combination was proper because "*Rosenberg* and *Snibbe et al.* both disclose force feedback on a document view," citing column 7 lines 1-10 of *Snibbe*. The examiner's assertion is incorrect, as discussed below, and, even if correct, still does not provide sufficient basis for the combination: *Rosenberg* suggests force feedback in document scrolling; *Snibbe* teaches force feedback for changing **resolution** of interaction. As discussed above, the proposed combination requires changing the principle of operation of *Snibbe* (changing resolution control to display control) and goes against the express teaching of *Snibbe* (that haptic navigation and haptic resolution control are incompatible).

The examiner, in the Office Action, stated that *Snibbe* teaches items such a computer representations of documents. Office Action page 2 lines 16-17, citing *Snibbe* column 3, line 61 through column 4, line 40. Appellant traverses the examiner's assertions regarding *Snibbe*. *Snibbe* column 3, line 61 through column

4, line 40, relied on by the Office, describes a hardware configuration, and relationships between haptic resolution control and haptic display, but has no mention of documents. Further, column 7 lines 1-10 of *Snibbe,* relied on by the examiner in the Advisory Action, also has no mention of document views; indeed, "document" does not occur **anywhere** in *Snibbe's* patent. The closest *Snibbe* comes to a "document" is the suggestion that the resolution of the interaction with a spreadsheet can be controlled with *Snibbe's* invention. *Snibbe* column 6 line 42. There is therefore no basis established for the proposed combination. Accordingly, Appellant submits that the examiner has not established a *prima facie* case of obviousness of Claims 1-23, and that Claims 1-23 are consequently in condition for allowance.

Issue 2. Does the art teach or suggest force-based control of a visual display of a document based on determination of the distance of a cursor from a haptic boundary?

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Claims 1, 2-7, 13-14, 16, 17, 18, and 21-23 all include limitations that control or scrolling of the visual display of a document be dependent on the location of a cursor relative to a haptic boundary or a threshold distance from a haptic boundary.

The examiner, in the Final Office Action, asserted that "*Rosenberg* discloses determining if a user-positioned cursor is within a threshold distance," citing column 6 lines 50-65. Appellant traverses the examiner's assertion regarding *Rosenberg*. *Rosenberg* has no such teaching; the section relied on by the examiner teaches the meaning of terms such as "grasp," "user object," and "widget," and provides no support for the examiner's assertion. *Snibbe* also has no such teaching, not surprising since *Snibbe* is not concerned with scrolling the visual display of a document. There is no evidence that the proposed combination teaches or suggests all the limitations of Claims 1, 2-7, 13-14, 16, 17, 18, and 21-23, and accordingly, there is no *prima facie* case of obviousness. Appellant submits that the foregoing claims are in condition for allowance.

Issue 3. Does the art teach or suggest force-based scrolling of a visual display of a document, with haptic boundaries at the top and bottom of the display, and with scrolling disabled when the visual display is in certain states?

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Claim 5 includes limitations related to a specific mode of the invention: haptic boundaries established at the top and bottom of a visual display, with scrolling disabled at a boundary disabled when a boundary of the document has been reached.

The examiner, in the Final Office Action, asserted that *Snibbe* taught this mode, citing *Snibbe* column 4 lines 46-65 and column 5 lines 31-63. Appellant traverses the examiner's assertion concerning *Snibbe*. *Snibbe* has no mention of scrolling visual displays of documents, and accordingly has no mention of this specific mode of scrolling. The sections relied on by the examiner do not support the examiner's assertion. *Snibbe* column 4 lines 46-65 concerns the basics of Snibbe's haptic interaction model, and has no mention of documents, scrolling, display boundaries, or disabling scrolling. *Snibbe* column 5 lines 31-63 concerns details about changing resolution of a haptic environment, and teaches that this is suitable with sparse environments where the user can interact at a coarse level of detail. The section has no mention of documents, scrolling, display boundaries, or disabling scrolling. There is no mention in *Snibbe* or *Rosenberg* of force-based scrolling relative to visual display boundaries, and no mention of disabling scrolling. There is no evidence that the proposed combination teaches or suggests all the limitations of Claim 5, and accordingly, there is no *prima facie* case of obviousness. Appellant submits that Claim 5 is in condition for allowance.

Issue 4. Does the art teach or suggest force-based scrolling of a visual display of a document, with haptic boundaries corresponding to the boundaries of a document displayed?

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Claims 6-7 include limitations related to a specific mode of the invention: haptic boundaries established approximately coincident with the boundaries of a document portion displayed.

The examiner, in the Office Action, asserted that Rosenberg at column 4 lines 38-65taught scrolling the display of a document according to the nearest edge of the document. Appellant traverses the examiner's assertion: the section relied on by the examiner teaches scrolling relative to a point of origin of an input device (e.g., scrolling based on a **cursor point**, rather than on a **document edge**). *Rosenberg* at most suggests that haptic scrolling might be possible. As discussed before, *Snibbe* does not suggest haptic scrolling or documents at all. Further, there is no mention in the art of scrolling based on haptic boundaries. Specifically as applied to the limitations of Claims 6-7, the art has no mention of establishing haptic boundaries approximately coincident with the boundaries of a portion of a document displayed. Accordingly, there is no *prima facie* case of obviousness of Claims 6-7. Appellant submits that Claims 6-7 are in condition for allowance.

Issue 5. Does the art teach or suggest force-based scrolling of the visual display of a document, with the force-based scrolling responsive to cursor motion relative to haptic boundaries established by a control portion of a haptic space?

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Claims 8-15 include limitations related to specific modes of the invention: force-based scrolling of the visual display of a document based on haptic boundaries established by a control portion of a haptic space.

The examiner, in the Final Office Action, asserted that *Rosenberg* teaches control zones, citing *Rosenberg* column 7 line 40 through column 8 line 20. Appellant traverses the examiner's assertion regarding *Rosenberg*. *Rosenberg* has no teaching of control zones used to control force-based scrolling of the visual display of a document. The section relied on by the examiner concerns **actuators** (column 7 lines 40-45), **forces to simulate springs, jolts**, etc. (column 7 lines 45-55), and **specific electronic packaging** (column 7 line 55 through column 8 line 20). *Snibbe* has no mention of control zones for force-based document scrolling, not surprising since *Snibbe* has no mention of document scrolling of any form. Since the art does not teach or suggest control zones for control of force-based scrolling of the visual display of a document, the art does not teach or suggest all the limitations of Claims 8-15, and there is no *prima facie* case of obviousness. Appellant submits that Claims 8-15 are in condition for allowance.

Issue 6. Does the art teach or suggest force-based scrolling of the visual display of document, with the force-based scrolling activated by moving a cursor into a defined control zone of the haptic space?

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Claims 11-14 include limitations related to a specific mode of the invention: initiation of force-based scrolling of the visual display of a document by user movement of a cursor into a control zone.

The examiner, in the Office Action, cited *Rosenberg* column 11 lines 31-57 for teaching of transition into a control zone. Appellant traverses this assertion by the examiner: *Rosenberg* column 11 lines 31-57 concerns **capstan drive mechanisms**, and has no mention of control zones or scrolling.

The examiner, in the Final Office Action, asserted that *Rosenberg* taught initiation of scrolling based on motion of a cursor into a control zone, citing *Rosenberg* column 45 lines 8-45. The examiner also asserted that *Rosenberg* taught transition into a control zone at column 4 lines 50-64. Appellant traverses the examiner's assertions regarding *Rosenberg*. *Rosenberg* has no mention of control zones, and no mention of moving a cursor into a control zone to initiate force-based scrolling of the visual display of a

document. In column 45 lines 8-45, relied on by the examiner, *Rosenberg* teaches that isometric control can be initiated by "pressing a button or other device." *Rosenberg* column 45 line 16. *Rosenberg* then teaches specific "restoring spring forces" that can be applied to the user. In column 4 lines 50-64, relied on by the examiner, *Rosenberg* teaches resistive forces and isometric control. The examiner incorrectly asserts that using isometric control to zoom a display (column 4 line 58) is the same as activating the control by motion of a cursor into a control zone (as in the subject claims). *Rosenberg's* zooming occurs **after** the activation of isometric control, and thus can not be the action that **initiates** the control. There is no mention of a control zone, or motion of a cursor into a control zone to initiate scrolling, both limitations of Claims 11-14. *Snibbe* has no mention of motion into control zones for force-based document scrolling, not surprising since *Snibbe* has no mention of document scrolling of any form.

Since the art does not teach or suggest control zones, and no mention of moving a cursor into a control zone to initiate force-based scrolling of the visual display of a document, the art does not teach or suggest all the limitations of Claims 11-14, and there is no *prima facie* case of obviousness. Appellant submits that Claims 11-14 are in condition for allowance.

Issue 7. Does the art teach or suggest force-based scrolling of the visual display of a document dependent on cursor motion relative to a three-dimensional control zone?

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Claims 21-23 include limitations related to a specific mode of the invention: force-based scrolling of the visual display of a document dependent on cursor motion relative to a three-dimensional control zone.

The examiner, in the Final Office Action, asserted that *Rosenberg* taught three dimensional control zones, citing *Rosenberg* column 1 lines 40-55. Appellant traverses the examiner's assertion regarding *Rosenberg's* teaching. The section relied on by the examiner is in *Rosenberg's* "Background of the Invention" section, and is the only mention of three dimensional interfaces in *Rosenberg*. *Rosenberg* at most acknowledges that three dimensional interfaces can be desirable, but then describes three dimensional interaction with a **simulated 3D environment**. *Rosenberg* column 1 lines 43-45. Rosenberg has no specific teaching about how such three dimensional interaction is to be accomplished, and has no mention of using a **three dimensional control zone** in connection with force-based scrolling of a display of a document (a **two dimensional** object). In contrast, the subject claims are limited to a three dimensional control zone, and force-based scrolling of the visual display of a document based on motion of a cursor relative to the control zone. *Snibbe* has no mention of documents, document scrolling, control zones, or three dimensional control zones. Accordingly, the art does not teach or suggest all the

limitations of Claims 21-23, and there is no *prima facie* case of obviousness. Appellant submits that claims 21-23 are in condition for allowance.

Issue 8. Does the art teach or suggest force-based scrolling of the visual display of a document dependent on cursor motion relative to a three-dimensional control zone, with the force-based scrolling initiated by cursor motion through an entry region into an active region?

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Claim 22 includes limitations related to a specific mode of the invention: force-based scrolling of the visual display of a document dependent on cursor motion into a three dimensional active region by motion through an entry region.

The examiner did not provide any explanation for any teaching or suggestion in the art of the limitation of Claim 22. As discussed previously, *Rosenberg* and *Snibbe* have no mention of three dimensional control zones for force-based scrolling of the visual display of a document. *Rosenberg's* only mention of three dimensional interaction does not discuss control zones, motion of a cursor into a control zone, or any requirement that the user move a cursor through an entry region to reach an active zone. Accordingly, the art does not teach or suggest all the limitations of Claim 22, and there is no *prima facie* case of obviousness. Appellant submits that Claim 22 is in condition for allowance.

Issue 9. Does the art teach or suggest force-based scrolling of the visual display of a document dependent on cursor motion relative to a three-dimensional control zone, with the three-dimensional control zone active in a subset of the motion of an input device in a z dimension?

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Claim 23 includes limitations related to a specific mode of the invention: force-based scrolling of the visual display of a document dependent on cursor motion into a three dimensional control zone, where the control zone is entered by the user by motion of an input device into a defined subset of the device's range of motion in a z dimension.

The examiner did not provide any explanation for any teaching or suggestion in the art of the limitation of Claim 23. As discussed previously, *Rosenberg* and *Snibbe* have no mention of three dimensional control zones for force-based scrolling of the visual display of a document. *Rosenberg's* only mention of three dimensional interaction does not discuss control zones, motion of a cursor into a control zone, or any relationship between motion of a three dimensional input device's z motion and control zones. Accordingly, the art does not teach or suggest all the limitations of Claim 23, and there is no *prima facie* case of obviousness. Appellant submits that Claim 23 is in condition for allowance.

Issue 10. Does the art teach or suggest scrolling of the visual display of a document whose rate is dependent on a force applied by a user to an input device?

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Claims 4, 7, 8, 9, 15, and 16 all include limitations that the rate of scrolling be determined on the input force applied by the user.

The examiner, in the Office Action, cited *Rosenberg* column 7 lines 31-65 as teaching control of the rate of scrolling determined from an input force. Appellant traverses the examiner's assertion regarding *Rosenberg*. *Rosenberg* at column 7 lines 31-65, teaches sensing motion of an input device, and provision of forces simulating jolts, springs, textures, and barriers. The section relied on by the examiner also begins a discussion of specific electronic packaging, and, like the rest of *Rosenberg* and *Snibbe*, has no mention of force-based scrolling. Since the art does not teach or suggest the limitation of scrolling rate determined from input force, it does not establish a *prima facie* case of obviousness of Claims 4, 7, 8, 9, 15, and 16. Appellant submits that Claims 4, 7, 8, 9, 15, and 16 are in condition for allowance.

Appendix.

The claims involved in the Appeal:

1. A method of providing user control of interactions in a computer display of an item, comprising:

a) Displaying a portion of the item;

b) Determining if a user-positioned cursor is within a threshold distance from an interaction boundary within the display, and if so, then:

i) applying a force to the cursor and communicating the force to the user;

ii) determining an input responsive force applied by the user to the input device;

iii) changing the portion of the item displayed, wherein the rate of change is determined from the input responsive force.

2. The method of Claim 1 wherein changing the portion of the item displayed comprises changing the display to correspond to a portion adjacent the previous portion in the direction of the boundary.

3. The method of Claim 1 wherein the item is a computer representation of a document.

4. The method of Claim 1 wherein the rate of change increases with increasing input responsive force.

5. The method of Claim 3 wherein scrollable boundaries correspond to the top and bottom of the display, and wherein scrolling in the direction of the top boundary is disabled when the top of the document is displayed, and wherein scrolling in the direction of the bottom boundary is disabled when the bottom of the document is displayed.

6. In a computer system providing display of a computer representation of a document, and user selection of the portion of the document to be displayed, a method of providing user control of scrolling among portions of the document comprising:

a) From the boundaries of the portion of the document displayed, determining which correspond to limits of the document;

b) For each boundary, establishing a haptic boundary in the range of motion of an input device approximately coincident with the visual boundary in the display;

c) Determining the position of a haptic cursor and, if the haptic cursor is near a haptic boundary that does not correspond to a limit of the document, then

i) Applying a force to the input device resisting motion of the input device toward said haptic boundary;

ii) Determining a user force applied by the user directed toward said haptic boundary;

iii) Scrolling the visual display of the document in the direction of said user force.

7. The method of Claim 6, wherein the rate of scrolling is determined from the magnitude of the user force.

8. In a computer interface comprising a display and a haptic space, a method of providing user control of interactions, comprising:

a) Displaying a portion of an item;

b) Providing a control portion of the haptic space;

c) Determining if a user-positioned haptic cursor is within the control portion, and if so, then determining if the haptic cursor is within a threshold distance from a controllable boundary of the control portion, and if so, then:

i) applying a feedback force to a user input device affecting additional motion of the cursor relative to the boundary;

ii) determining an input force applied by the user to the input device;

iii) changing display of the item, wherein the rate of change is determined from the input force.

9. The method of Claim 8, wherein the rate of change is determined from the magnitude of the input force.

10. The method of Claim 8, wherein the control portion is activated responsive to direction of the user.

11. The method of Claim 8, wherein determining if a user-positioned haptic cursor is within the control portion comprises moving the haptic cursor responsive to user control of an input device, and determining if such movement moves the haptic cursor within the control portion.

12. The method of Claim 8, wherein determining if a user-positioned haptic cursor is within the control portion comprises detecting an indication from the user to move the cursor into the control portion.

13. The method of Claim 8, wherein providing a control portion comprises providing haptic boundaries separating the control portion from the remainder of the haptic space.

14. The method of Claim 13, wherein determining if a user-positioned haptic cursor is within the control portion comprises moving the haptic cursor responsive to user control of an input device, and determining if such movement moves the haptic cursor near a boundary, and if so, then applying a force to a user input device affecting further motion relative to said boundary.

15. In a computer interface comprising a display and a haptic space and adapted to display a document, a method of providing user control of scrolling the display of the document comprising:

a) Providing a scrolling zone portion of the haptic space, said portion disposed near an edge of the display of the document and extending from a first end to a second end oriented substantially parallel to the edge;

b) Determining the position of a user-controllable cursor in the haptic space, and, if the user cursor is within the scrolling zone portion and within a threshold distance of the first end or the second end, then

applying a feedback force to a user input device resisting motion of the haptic cursor toward the nearest end, and determining the magnitude of a force applied by the user in opposition to said feedback force, and scrolling the display of the document in the direction according to the nearest edge at a rate determined from the magnitude of the user-applied force.

16. In a computer interface comprising a display and a haptic space and adapted to display a document, a method of providing user control of the display of the document comprising:

a) Detecting user activation of a control mode of interface;

b) When not in control mode, providing a computer interface suitable for interaction with the document;

c) When in control mode:

i) establishing haptic boundaries relative to the position of a user-controlled cursor when the user activated the control mode of the interface;

ii) determining the position of a user-controlled cursor in the haptic space, and, if the cursor is within a threshold distance of a haptic boundary, then applying a feedback force to a user input device affecting further motion of the cursor relative to said haptic boundary;

iii) determining the magnitude of a user-input force applied by the user to the user input device, and changing the display of the document in a direction according to the haptic boundary nearest the cursor at a rate determined from the magnitude of the user-input force.

17. A computer-readable medium having stored thereon computer-executable instructions for performing the method of Claim 1.

18. A computer-readable medium having stored thereon computer-executable instructions for performing the method of Claim 6.

19. A computer-readable medium having stored thereon computer-executable instructions for performing the method of Claim 8.

20. A method of controlling interaction with a computer display of a document, comprising:

a) Determining an input force applied by the user to an input device;

b) Changing the display of the document according to the direction and magnitude of the input force.

21. A method of controlling interaction with a computer display of a document, comprising:

a) providing a three-dimensional control zone;

b) determining if the user indicates a transition into the control zone, and if so, then determining if the user positions a cursor near a boundary of the control zone, and if so, then determining an input force applied by the user to an input device and changing the display according to the direction and magnitude of the input force;

c) determining if the user indicates a transition out of the control zone, and if so, then providing interaction according to an application associated with the document.

22. A method as in Claim 21, wherein:

a) the input device is moveable by the user in a three-dimensional space, characterized by x and y dimensions corresponding to a plane approximately parallel to the document displayed, and by a z dimension approximately orthogonal to said plane; and

b) the three-dimensional control zone comprises a portion of the three-dimensional space characterized by an entry region, defined by x, y, and z coordinates, and an active region, defined by x, y, and z coordinates, with the z coordinate not identical to the z coordinate of the entry region; and

c) determining if the user indicates a transition into the control zone comprises determining if the user has moved the input device from the entry region to the active region; and

d) determining if the user indicates a transition out of the control zone comprises determining if the user has moved the input device from the active region to the entry region.

23. A method as in Claim 21, wherein:

a) the input device is moveable by the user in a three-dimensional space, characterized by x and y dimensions corresponding to a plane approximately parallel to the document displayed, and by a z dimension approximately orthogonal to said plane; and

b) a subset of the z dimension corresponds to a control portion; and

c) determining if the user indicates a transition into the control zone comprises determining if the user has moved the device such that the z coordinate of the device is within the control portion; and

d) determining if the user indicates a transition out of the control zone comprises determining if the user has moved the device such that the z coordinate of the device is not within the control portion.